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Forecasting the weather
- ensemble techniques
in probabilistic weather prediction

Use of National Emission Inventories for air quality modelling and development of emission reduction plans

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Air quality is considered a basic requirement for human health and comfort. However, air pollution still poses a severe threat to human health around the world. European Directive 2008/50/CE defines objectives to ensure clean air, urging responsible authorities to establish policies and procedures to maintain or improve air quality.

Air quality management is complex due to the many different interconnected processes that take part in the chemical formation and dispersion of pollutants in the atmosphere. Photochemical models are fundamental tools in modern air quality management, especially for secondary pollutants, because they allow relationships to be found between emissions and observed pollutant concentrations. Moreover, current models are complex enough to represent atmospheric chemistry adequately.

Photochemical models require high-resolution emission input data, both spatially (1 km o even more) and temporally (hourly). Emissions are a critical part of air quality modelling because they represent the raw material for physical and chemical processes. Nevertheless, most of the uncertainty managed in the development of air quality plans comes from the estimation of anthropogenic and biogenic emissions.

Estimating emissions for air quality modelling requires coping with large data sets related to emission sources; unfortunately, this information is not always available. In this work we present a methodology based on the joint use of National Emission Inventories with low spatial (values aggregated for a country) and temporal resolution (annual values), and high-resolution land use maps.

The advantages of using National Inventories for estimating anthropogenic emissions are that they are easily accessible, they are subject to revisions and quality controls, and they are annually up-dated. The information in the Inventories is distributed over more than 430 emission sources separated by SNAP categories. This classification guarantees an appropriate spatial distribution of the emissions if high-resolution land use maps are used. In this work CORINE land use maps and national road maps have been employed.

This national information has been additionally complemented with: (i) the European EMEP Inventory to compute emissions outside national territory; (ii) the Guenther biogenic emissions model to estimate natural volatile organic compound emissions from vegetation, (iii) the EPER register for individual chimneys considered as large point sources and, finally, (iv) other data provided by environmental managers for improving the information on the study area.

The temporal distribution of emissions employs: road traffic profiles for weekend and weekday, a constant time profile for industries and domestic emissions and a time variation according to the daily meteorology for biogenic emissions.

The advantage of this methodology is that all the information used can be easily obtained, thus facilitating a realistic spatial and temporal emission distribution. Moreover, this methodology enables the implementation of a modelling system for air quality management based on official emission data.

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